Case Study Report

Co-created Positive Energy Districts

Activating local actors for a common roadmap

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Abstract

The Energy Balance for Positive Energy Districts (PED) aims to balance the energy needs of a defined area (caused by people) with the production of energy (technology). Most energy transition projects concentrate on improving and developing the technical aspects of energy creation and consumption balance while disregarding human use factors, resulting in not being able to achieve true positivity year-round. In this study, we will delve into and discuss means of ensuring citizen involvement in the pathways of PEDs.
In the European Network PEDEDUNET and in our international project PED-ACT, we have been experiencing how citizens are systemically excluded in the process of the establishment of a PED. The technology is ever-evolving, meaning newer applications can involve different sources of renewable energies and calculate them in price and quantity, yet PEDs are unfortunately far from having the significance hoped for, or the desired impact in energy transition ambitions. We believe this is due to a lack of involvement of affected people in the project, it's progress, and the process. At the same time, there can be worries and power imbalances among citizens and stakeholders (such as between a building owner versus building users such as tenants), which results in lack of participation and involvement. Using a quadruple helix approach, we have been active in approaching 5 different communities across 5 different European geographies. Despite all of them being managed top down in terms of energy planning, production, and delivery, we have managed to find and develop different recipes to ensure citizens take part in the PED evolution.
The energy sector is perceived as a technological field, in which many citizens have very little knowledge or rights to make decisions. If we insist on keeping this top-down culture, we cannot profit from the potential contribution of citizens and will be forced to rely only on the capacities of a few decision makers, as has already been done over the last decades. Especially in PED projects, the citizens are expected to change their behaviours (in energy consumption) to enhance energy flexibility, but they are not an involved actor of the process. If we do not change this dynamic, we believe technology will not be able to contribute as desired towards the energy transition agenda.
Learning objectives resulting out of our PED-ACT project are:
1 : a clear role for citizens in PEDs
2 : a clear say for citizens in PEDs
3 : a clear reward system for citizens in PEDs

Keywords

co-creation with citizens and their representatives, energy transition with all, positive energy districts, collaboration pathways, quadruple helix in PEDs

1. Introduction

Approximately 40% of the energy consumed globally is by buildings (Kolokotsa et al., 2011). The initial aim and purpose of the positive energy concept was to create positive energy buildings and solve the energy

demand of a very specific building. Nowadays, buildings can perform zero-net sustainable energy use on their own plot, use zero-net energy, be circular, and grid-friendly. Positive-energy buildings utilise thermal simulation models of the buildings, which allow the equipping of buildings for integrated control and optimization tools. The EU Parliament has already requested that by 2019, all new buildings be optimized to zero-energy and emission standards (European Parliament, 2009) - a request that has still not been fully implemented throughout Europe. Recently, the focus has expanded from individual houses to seeking ways of ensuring whole city districts and neighbourhoods (Magrini et al., 2020) become positive. In 2018, the EU launched the "Positive energy districts and neighbourhoods for sustainable urban development" programme, with the aim of supporting the planning, deployment, and replication of 100 Positive energy districts (PEDs) by 2025. The ambitious programme resulted in the focus turning towards cities over the last decade, given that they have extensive potentials to ensure the sustainability transition (Gireesh et al., 2023). The urge to combat challenges of climate change are quite dominant in these multi-layered societies; many projects and a large portion of the national and international funds go towards cities. For purposes of the projects, urban tissue is broken down to districts and neighbourhoods. Within cities, these manageable units present a manageable size and complexity that allows the testing of new approaches in the journey of sustainability (Good et al., 2017; Magrini et al., 2020). An improved and optimised urban unit has the potential to reduce energy use and consequently decrease the amount of greenhouse gas emissions. Analysing the approach of several PED projects, we determined that users and citizens are mentioned in most of them, yet the core focus lies within the range of technological solutions. Our focus therefore is to elaborate on the people and communities, and to bring forward new partnerships that can handle, through a collaborative process, the course of becoming of a PED.

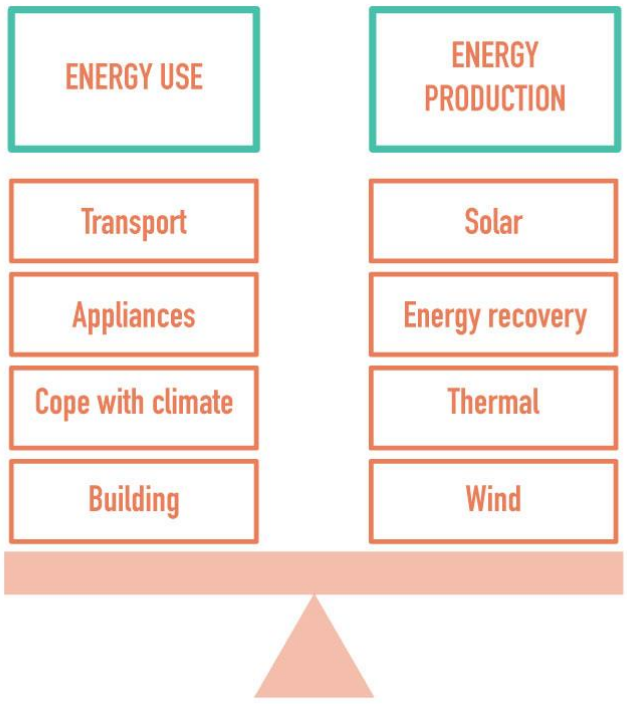

Figure 1. Balancing the Energy consumption and production

1.1. Incentives regarding PEDs

There are many incentives that are directly and indirectly related to PEDs. The European Energy Research Alliance (EERA) is the largest energy research community in Europe, encompassing 250 universities and public centres from 30 European countries, with 17 joint programs (EERA) and the mission of fostering energy research for achieving climate neutrality by 2050 (Soutullo et. Al., 2020). The Energy Performance

of Buildings Directive (EPBD) highlights the importance of altering Europe's building stock to become energy efficient and decarbonized by 2050 (Brozovsky et. al. 2021).

The SET (Strategical Energy Technology) Plan Action 3.2, "Smart Cities and Communities" promotes the development of low carbon technologies in fast and cost-competitive ways (Clerici Maestosi et. al. 2021). What's more, the Horizon Programme funds research projects in this field. Based on these incentives and programmes, it is possible to interpret that in different societies of the EU, the potentials of the PED concept are seen as a major opportunity. The aim is also to strengthen the projects' outlook towards mitigating climate change and degrading the effects of the building sector regarding it (Brozovsky et. al. 2021).

1.2. The PED-ACT project

Positive Energy District (PED) is important for city development. PED-ACT focuses on the process optimization for enhanced stakeholders' cooperation and reinforced decision-making. PED-ACT contributes to the standardisation of the database of existing PEDs (planned, designed, or implemented) with a focus on Sweden, Turkey and Austria. PED-ACT further learns from the database and creates digital PED references by mapping stakeholders' needs and priorities in cities of Borlänge (Sweden), Umeå (Sweden), Ankara (Turkey), Karsiyaka (Turkey) and the community Schönbühel-Aggsbach (Austria). PED-ACT pursues bilateral learning and co-design strategies among different municipalities for wide replication of cocreated PED roadmaps towards 'climate-neutrality and smart cities' goals.

2. Social aspects of PED

PED developers are aware that the social aspects can on the one hand, be one of the main factors contributing towards the successful implementation of a project, while at the same time, become one of the main challenges (Krangsås et al., 2021, Baer et. al., 2021). Nevertheless, the social aspects regarding PED development (along with microclimate related issues) remains as of the least researched topics in the field (Brozovsky et. al., 2021). We believe it is of utmost importance that citizens and developers change their behavioural patterns from a passive mode and move towards partaking in 'active prosumption' as "prosumers" (Bossi et. al., 2022; Ahlers et. al., 2019). The term "prosumer" is derived from the words 'PRO-ducer and con- SUMER, which refers to consuming energy, while also producing energy surplus to be shared with neighbours (Magrini et al., 2020). The term "energy citizenship" also bears similarities to the term 'prosumer'. To allow this role-shift to happen, PED projects need to develop a collective and inclusive space for the participation and engagement of citizens (Olivadese et. al., 2021). The social aspect differs from context to context very much and needs to be catered to the local conditions and needs of the local players and stakeholders, as well as capacities. We work in three different national contexts with very specific conditions and legal frameworks within the project.

2.1. Austrian national context – the energy communities

A legal change in 2021 took place in Austria, favouring the creation of energy communities throughout the country. Despite the initial challenges (such as contracts with energy suppliers, obtaining technical devices or technicians, or delivery ques for solar panels, organisation form and structure, slow acquisition of members, administration barriers, financial hurdles, to name a few), many energy communities popped up in remote places, yet with very limited impact on the energy transition aims of the country.

In this context, motivated communities struggle with administrative hurdles especially, and are stuck with the a lack of capacity in smaller municipalities. The Austrian Case in the project is the energy community of Schönbühel-Aggsbach, an NGO (currently 1 prosumer, 13 consumers) that aims to grow and develop a

PED through a bottom-up process by bringing different energy sources (water & sun) together with a variety of small local actors (aim: 40 prosumers, 180 consumers).

The energy community is interlinked with regional players, and the regional collaboration could improve the impact of small municipalities in the energy transition, while improving the natural habitat and take on the cultural heritage to future generations.

Energy specifications 2022

Schönbühel-Aggsbach currently has an energy demand of 21.200MWH per year (and growing), with half of this amount used for housing, and the other for mobility. Only ¼ of the demand is covered with renewables. To reach the goals of the 2050 sustainability plans, the area needs to reduce the demand to half and convert to usage of fully renewable energy. The region is a protected heritage landscape, and windmills and water turbines are not an option due to regulations, and cannot therefore be used as part a regular solution. Due to the location of the area, solar energy seems to be a favourable option. The solar energy collection is widely possible on private roofs, but the surfaces are rather small and not effective in creating surplus energy. The community needs to increase the cost-effectiveness of energy production and eventually find or develop new ways of dealing with heritage regulations to potentially opt for thermal energy sources, while initiating collaborations with other municipalities in the district and region.

Vision and goal:

To develop a just governance and business model, which allows local communities to cross-finance their environmental and cultural projects, while sharing sustainabe, locally produced energy at an affordable price.

Policy implication:

To enhance and advance the energy community legacy with bottom-up PED development, financial instruments, funding instruments, and regional collaboration possibilities (beyond the borders of the municipality).

2.2. Swedish national context – the Nordic demands

Building retrofitting is critical to achieve PED status in an area, especially when these are located in colder climates with denser populations (Bruck et al., 2022b). It is difficult to reach positive energy buildings in Nordic urban areas if all energy demands of the building are included (Rehman et al 2022).

In Sweden, the Government intends to introduce a climate declaration requirement when buildings are constructed, which will enter into force on 1 January 2022. It aims to promote the transition towards more sustainable construction with reduced climate impact, and to develop a national database that can help set minimum requirements based on a life-cycle perspective (Climate Act Sweden, 2022). However, there is no obligation for a network concession to transfer electricity from one property to another (Fastighetsägarna, 2022). In the district heating sector, energy and carbon dioxide taxes are levied on the supply, import, and production of fossil fuels for heating purposes (Renewable Energy Policy, 2017). Renewable energy sources are exempt from these taxes (Hållbarhetskriterier, 2010).

Given this context, we selected a housing neighbourhood in Borlänge and Umeå, to develop two distinctive roadmaps with the local universities taking the lead, and in collaboration with the local actors. The municipal housing organisations are partners in both cities and a scenario does not exist yet, on how local tenants could be involved in the PED development, given that they have no decision rights in the process so far. The similar constellations of local players with no decision rights can be found throughout the country, and a good roadmap could help many neighbourhoods become positive as a result.

Energy specifications 2022

The neighborhood in Borlänge and Umeå have the target of achieving carbon-neutrality by 2030. All the main energy supply to buildings, transportation, district heating etc, will be zero-carbon or from a renewable based source. The source of Energy supplied to Industry however, is excluded from this plan.

Vision and goal:

To develop an inclusion model, which engages citizens and tenants in the energy transition and allows the bottom-up initiation of such processes in other municipalities as well.

Policy implication:

The Borlänge and Umeå Municipalities have adopted an environmental strategy with ambitious targets for climate mitigation, energy efficiency and renewable energy. These two cities are a part of the innovation programme titled Viable Cities – 'Climate Neutral City', which brings 23 Swedish cities together with the aim of reaching climate neutrality in cities by 2030. Borlänge and Umeå are, together with the other cities, a part of Viable Cities Transition Lab, which is a learning process, including recurring national fora with other cities and stakeholders. The aim is to explore and shape the theory and methods of change as well as building distributed knowledge and expertise, to be used as a basis for action that enables accelerated climate and sustainability transition in cities.

2.3. Turkish national context – the Mediterranean potential

Since Türkiye is outside of the EU but strongly linked with funding opportunities as an Associate member and some collective sustainability goals, retrofitting Turkish settlements to achieve energy positivity is critical to the reduction of emissions. The districts in southern Europe have a better feasibility (economic viability) of PED projects (Bruck et al 2022a) and developing such projects in this favoured climate have instead, complications from legal and political standpoints.

In Turkey, the centralised governing model, financial challenges, as well as property owner models leave less space for the local or bottom-up development of PED projects. At the same time, local resources (wind, water, solar, thermal) appear as promising sources for the production of local renewable energy, and the population has an entrenched memory of energy poverty in the past, given that the energy shortage of the 80's and 90's was challenging for homes and industry alike.

In this context, two dominantly residential neighbourhoods have been identified as PED boundaries in Ankara and Karşıyaka, a district municipality within the boundaries of the Izmir Metropolitan City. PED boundary selection in both contexts was carried out by the municipalities, Middle East Technical University (METU), İzmir Institute of Technology (IIT) and Demir Energy, while building and energy systems modelling, and scenario analysis was performed by METU. The pilot area in Ankara consists of 55 low-rise, single-family residential buildings, with a total floor area of 19.300 m2. All buildings were constructed in the 1980s, therefore they adhere to the building codes of that era. Two alternative sites are being considered in Karşıyaka. The first alternative consists of two buildings with a residential area of 6500 m2 and an office area of 2000 m2. The area was built in 2018, meaning that it adheres to the most recent building codes regarding envelope materials. The mix of commercial and residential areas was another positive feature towards energy positivity. The second alternative was built in 1993 and consists of 21 residential buildings. All sites have rooftop PV potential. Opportunities for PV instalments will be considered on other neighbouring buildings that are managed by the municipality.

Local stakeholders will be integrated in co-design activities to raise awareness and sustain energy transition in the neighbourhoods.

Energy specifications 2022

Izmir is selected as one of the NetZeroCities that aims to be carbon neutral by 2030. Aligned with this ambition, Karşıyaka has developed SECAP.

Vision and goal:

To reduce the energy demand of the existing building stock in both cities, and to meet the demand with on-site renewable energy production, as much as possible.

Policy implication:

The Karşıyaka Municipality is a member of many international organizations such as the Covenant of Mayors (CoM), Healthy Cities Association, European Energy Cities Network and Healthy Cities Network. The Strategic plan of the Karşıyaka Municipality, covering the years of 2019-2024, identifies many strategies in order to produce services with a sustainable and healthy environment, in order to increase the quality of life, protect from climate change and its effects on a path towards creating a more sustainable city. Aligned with this goal, the aim is to adapt to the climate by increasing the use of renewable energy and focusing on sustainable environmental decisions.

The most recent Sustainable Energy and Climate Action Plan (SECAP) of the Karşıyaka Municipality was prepared in 2021. In the plan, action topics such as buildings, energy, waste, and transportation to reduce greenhouse gas emissions, the protection of water resources, public health, disaster management, green areas within the scope of adaptation to climate change were determined and 32 actions, mostly on energy, were planned to be implemented. The Plan emphasized the importance of solar energy and geothermal energy in order to increase the use of renewable energy, and actions were shaped accordingly.

The strategic plan for 2020-2024 of the Metropolitan Municipality of Ankara, the capital of Turkey, has set its vision as being "t...he leading capital city in a developing and changing world while making the capital of the Republic a liveable, sustainable brand city by protecting its historical, cultural and environmental values." In line with this vision, "To create a city that protects the ecological balance, supports biodiversity, is based on effective waste management and renewable energy policies, has adopted sustainable environmental management, and is aware of the negative effects of climate change."

The Ankara Metropolitan Municipality became a member of the Covenant of Mayors in 2021. In the Sustainable Energy and Climate Action Plan (SECAP), projections and scenarios were prepared for the next 10-year periods, and it was determined that greenhouse gas emissions will increase up to 400% if measures were not taken. Priority and high targets have been set for greenhouse gas mitigation, especially in the buildings and transportation sectors. Strategies such as converting municipal buildings into energy efficient buildings, implementing green building standards, realizing LED conversion in all public spaces and according to the needs of citizens, and implementing incentives for buildings with Energy Identity Certificates have been developed. At the same time, city-specific projects are being developed to reduce greenhouse gas emissions by increasing rail connections and encouraging the use of electric vehicles and public transportation. Within the scope of adaptation to climate change, regional projects are also being implemented to improve infrastructure, ensure water management, and implement sustainable land use decisions in the city, which has faced floods many times.

3. Collaborative PED planning approach and method

Challenges within and inspiration for PED projects

All cases in this collaboration are typically managed top-down, lacking a collaboration and communication culture that manages or handles energy transition with the citizens. Co- creation with bottom-up initiatives and involving them in the development of Positive Energy Districts is in our opinion, an overlooked key element for successful and impactful PEDs.

Within the framework of this collaboration, we are developing a database for Positive Energy Districts and helping communities and decision makers in selected cities/towns of Austria, Sweden and Türkiye, find appropriate roles and paths that can ensure collective work on the energy transition. From the point of the citizens, there is a big gap of what the people's role and contribution could be in the energy transition of our nations. As such, we are focussing on three aspects to develop the roles of citizens in the PED development:

- a clear role for citizens in PEDs
- a clear say for citizens in PEDs
- a clear reward system for citizens in PEDs

We have determined that citizens and their organisations are overlooked in Planning and policymaking (within the field of energy transition). At the same time, there is no-true PED in Europe so far. We believe one reason for this is the lack of collaboration with/from citizens and people. Given that the PED needs to balance energy needs and energy production throughout the day and year, a significant half of the PED relies on people, who are (for instance as renters) excluded from planning or implementing the process.

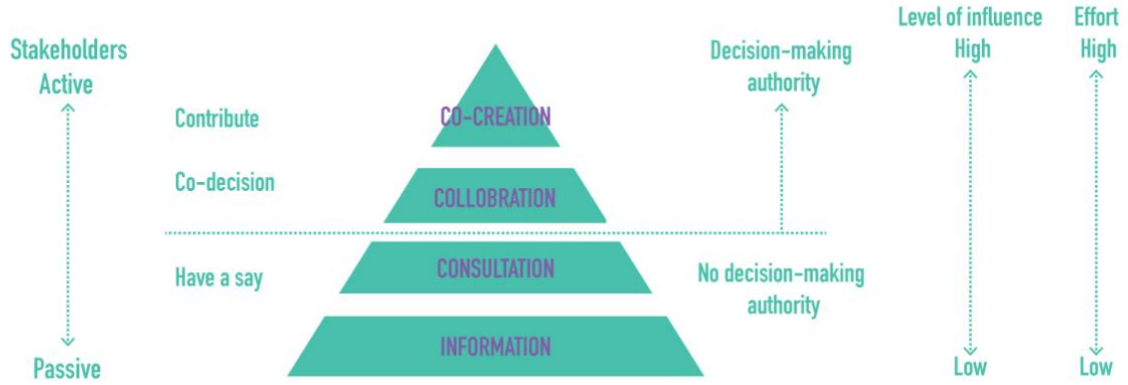

Figure 2: stakeholder engagement pyramid

True participation goes beyond the mere legitimisation of existing planning. It must create open spaces in which citizens can get involved. Especially in the case of urban transitions, this also requires a political willingness and the openness of experts on innovating and adapting their own practices. On the one hand, people must be made aware of the possibilities that could be achieved with their participation, and at the same time this "promise" has to be sincere and applicable. In addition, low-threshold access to the case process must be created, and linguistic, spatial and cultural barriers must be dismantled in order to enable very different people and population groups to participate and contribute to decisions and the design. Successful participation depends on whether all relevant stakeholders have been identified and involved, as well as what they can contribute to the process.

Division of labour in the sense of cooperation means dividing a task into different subtasks so that different people or groups of people can work on them in parallel; citizens can also fulfil subtasks in a true collaborative fashion. Beforehand, consultation and mediation are necessary to define the common goal and to clarify who can or will do what. Responsibilities always need to be clearly traceable within the cooperative working process. Participation in sum refers first of all in general terms to the involvement of people in decisions that affect them directly or indirectly. In this case, it is about listening to their opinions and ideas and taking them into account, as well as involving them in the creation or implementation of solutions. The degree of involvement defines the role and the main aim of the participation process.

The ladder of intensity in participation can be divided into four main types of working together with citizens.

- information,
- consultation,
- cooperation and
- co-creation

In very complex cases and when there is little knowledge or expertise within the citizen group on the topic, the participation methodology is used mainly for **information** purposes. The main aim here is to raise awareness and communicate the content to citizens etc. Given that there aren't many requirements from the participants, this way of participation can be addressed to a wide audience.

When citizens expect feedback on mainly pre-elaborated solution proposals, the participation process elevates citizens who live in the relevant context, to the role of experts, with the act of participation transforming into a citizen **consultation**. Their opinion is validated with this act.

If citizens are able to fulfil even certain tasks or roles within the transformation process, the participation evolves into a **cooperation**. Requirement for this is of course, that the necessary expertise is available among the audience.

In the most intense participation form, citizens are involved in a way in which they can **co-create** and design the solution in quest in a collective manner.

Next to knowledge and expertise among citizens, the intensity of the participation is also a legal, financial and ethical issue, and has to be framed differently from the beginning. Process leaders have to be careful to ensure they don't promise too little engagement (effort) and overburden the participants with ongoing demands. What's more, promising the co-creation of a solution while there are no frameworks or resources to fulfil this promise, can upset the citizens as well. Next to the degree of involvement, the sequences of involvement determine a fruitful participation.

Top-down versus bottom-up

Decision makers, business owners and property owners have clear expertise, budget, and other resources to develop a PED project, while communities that have to live in such PED's and are not involved in the process and can't play a role in shaping the solutions in a way in which it supports their way of life, or proactively contribute with solutions to the transition. On the other hand, community developed projects such as local energy communities, continue to struggle with obtaining expertise, a budget, and other resources to employ solutions that can provide real contributions to the energy transition. From this perspective, bringing both approaches might cause difficulties, but can create enormous synergies. Yet the way to link the bottom-up with top-down is very tricky and challenging, given that the players have different sensitivities and power schemes.

3.1. PED-ACT's Quadruple Helix Approach

PEDACT prioritizes greater public involvement in PED processes with the Quadruple-Helix approach (Schütz et al., 2019; Carayannis and Campbell, 2009). This approach is used to democratise knowledge and allow social innovation in the PED development process. Partners engage the governmental, research, business, and civil society sectors in the creation of the roadmap to become a PED. PEDACT creates a framework, which allows the possibility of co-designing together with the local communities, which consist of a cross-departmental task force, investors, landowners, young professionals, and service providers, next to citizens. In PED-ACT, we will be defining which participation framework we will be employing (information, consultation, cooperation or co-creation), together with the local stakeholders.

3.2. PED Test Designing

PED Test designing is an informal planning procedure that is employed with the selected cases in PEDACT to develop a roadmap and scenarios under different conditions. It is particularly suitable in the exploration processes (Scholl, 2017). We gain valuable insights to prepare and complement the roadmaps and scenarios. By employing this method in 5 different cases, we create deeper knowledge and synergies. Therefore, the test designing procedure supports the partners to take future project decisions in a comprehensive way. A clear role definition and expectations description is created from the beginning in the testing phase, to explore the challenges and opportunities of the scenarios.

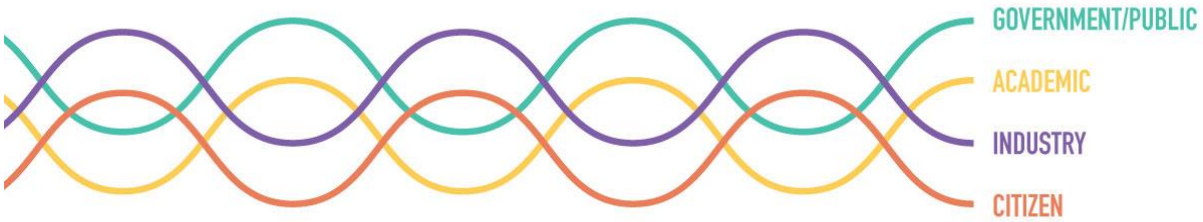

Figure 3. Collaboration in the quadruple helix model

The quadruple helix approach has in all cases of PED-ACT, different stakeholder constellations. In Sweden for instance, project partners are the municipality, housing provider and energy provider. The country is a predominantly renting-housing-market, resulting with the role of citizens being very limited due to the limited decision-making potentials. In the Swedish context, project partners will employ the information model for participation.

In Turkey on the other hand, the housing market consists mostly of individual house-ownership. This means there are many stakeholders for each site, which brings up a need for coordination. At the same time, all transition topics are handled with a central governance model via top-down methods. Due to the local culture, and novelty of PED concepts in the country, partners will use the model of information, with their citizen engagement activities.

In Austria, the energy community, as a representative of informed citizens of the energy transformation agenda, carry interest and preliminary knowledge about the topic. The aim here is to create a collaboration within this project and to further co-create the future scenarios with the energy community for the region. The rural housing market consist of predominantly individual homeowners, so local participation work will also entail information-based participation for wider audiences.

4. PED designing a roadmap

4.1. Test designing process

Figure 4. The PED-ACT process

The process is based on an implementation of the following phases:

Phase 1:

The designing process is set up to be informed through a clear pathway, which is followed in all 5 cases. Following a kick-off process with bilateral exchanges and talks among stakeholders, local needs, actors and opportunities are mapped. Academic and technical partners support local actors in the selection of a proper PED demonstration area as well as with energy modelling. In bilateral interviews, potential roles within the energy transition paths are defined for local actors.

Phase 2:

The outcomes of the first phase are presented and discussed with the local community, with an open invitation to participants to take up a role in the scenario, as well as to define the goals of the roadmap. The outcomes of the first phase have to be concrete enough to show potentials of participation and engagement, but flexible enough to further shape the roadmap collectively. After this open invitation workshop, roles and partnerships are further developed and key milestones for the scenarios defined collectively.

Phase 3:

In bilateral collaborations, the scenarios are developed to be in part, paths of a comprehensive roadmap towards becoming a PED.

Phase 4:

The last public event is the moment where the cohesive roadmap is handed over to the local actors, and potential supporters (e.g. funding givers) are invited to participate in the implementation phase.

4.2. Test designing process

The PEDACT project has so far generated a positive response from decisionmakers at local and regional level as well as the communities. The potential regional impact can be also recognized, since the approach

is multipliable. Given that the development of PEDs in such contexts has been a major challenge for the five involved municipalities and communities, this way of collaborative working, creation of organisational capacities and developing methodological processes is promising for further replications.

Thanks to the approach and adopted method, this designing process illustrates how knowledge and innovation can be developed through an inclusive exchange culture. The stakeholders of future PEDs will profit from the experience and new input infiltrated by the actors of the Quadruple Helix Model. This approach makes the design community centred and responsive to local needs and challenges. Due to the current energy crisis, developments have to create synergies and involve citizens in the transition process from the beginning. The PEDACT Project builds internal capacity in the municipalities by bringing different groups of actors together and involving them in the creation of a common roadmap, with clear roles and paths for all actors. This method of thinking will allow municipalities to properly adjust the aims, needs and resources of their projects.

In this context, we recommend a further elaboration of citizens roles to clarify the offers for them, and to ensure they have a realistic chance to participate, engage and perhaps innovate.

1 : a clear role for citizens in PEDs
2 : a clear say for citizens in PEDs
3 : a clear reward system for citizens in PEDs

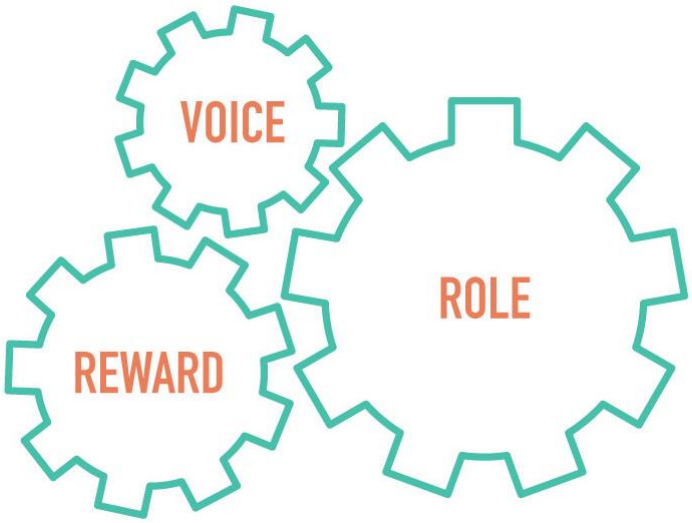

Figure 5. Pillars for stakeholder engagement

Within this context, we've developed five pillars for the engagement of stakeholders

The Role

Any roadmap has to have clear **roles** with expectations, expertise, duties and recommendations, and perhaps even with best case descriptions. As such, one can draw an analogy with a theater play, in that the opportunity to play various roles and be a part of the process, can be appealing for citizens engaged with fewer resources. This aspect of handing toles and creating "actors" that take part in the process (or the play), is very often forgotten or not incorporated into common roadmaps, but are in our opinion crucial to ensure citizen collaboration.

The Voice

Citizens are generally kept on short notice and often have to choose between predefined ideas within the process of engagement, which leads to engagement fatigue. If the process plans to give an active role to the citizens, then it has to be clear on the fact that they each have an individual own voice that acts as a vehicle to put forth their own interests and benefits, complaints, ideas, restrictions and demands. There must be a clear concept on how they can have their voice heard, how the communication and decision process works as part of this design, and how much influence they can exert on the decision making process as well as where the limits are to be drawn. Disappointing citizens in this field will lead to tensions and perhaps even to a loss of citizen engagement – which in a PED project can lead to unsuccessful PED results.

Rewards

Rewarding citizens and the reward scheme is quite connected to the topic of engagement and being heard. Citizens are people who consume energy and use that energy to produce things. At the same time, they might come from diverse backgrounds. They might be educators, artists, shipowners, SME's, developers, innovators…. etc. Their individuality and therefore sources of motivation could quite possibly differ significantly. Having a conclusive idea on how to reward which role with what kind of activity is very important. And this is obviously not only limited only to financial rewards, but connected to all sorts of rewards.

5. Conclusions

The energy crisis was one of the greatest challenges for the PED-ACT societies in the last two years. There were some great lessons learned, which lead to higher sensitivity and awareness among citizens. This is a fruitful base to start the work with citizens, even though they might be differing within the scope of this project in capacities and constellations in all three project countries. We are taking on an experimental approach, and the initial work looks promising.

The collaboration workshops organized highlight many unresolved issues and an even greater power imbalance, a topic that needs to be addressed and debated to ensure a more satisfactory outcome for the participants. The various views of a broad variety of stakeholders, with their diverse abilities, resources, ideas, and commitments urgently need to be incorporated as a common practice in PED development. The relevant decisions need to be made with a broader consensus and thus a greater capacity and in a quick manner. This process needs to be orchestrated from the outside.

Even though the PED-ACT project works on a common database, building relationships with different social and interest groups is more important than ever. The partners are aiming to develop digital support for operating social groups, not the other way around. Based on the lessons learnt, the energy transition model needs to be reconsidered. We need to make room for the increased attention to power imbalances and ensure that a just participation culture can be established, one that allows positive solutions to be implemented – and not merely the solutions coming from (or serving the interests of) the powerful only. So, beyond the technological solutions and emerging energy agenda, one of the most striking impacts of the energy crisis is the need to acknowledge citizen empowerment, in order to be able to better respond to future crises.

Acknowledgement

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